What is claimed is:

203	>1	1. A method for identifying an OP-1 receptor-binding analog, said
مروس	2	analog being characterized as having substantially the same
	3	binding affinity for a cell surface receptor as OP-1, the method
	4	comprising the steps of:
	5	(a) providing a sample containing a protein selected from the group
	6	consisting of:
		(i) a polypeptide chain comprising an amino acid sequence
	7	defined by residues 16-123 of Seq. ID No. 3 (ALK-2), or an
	8 9	OP1-binding analog thereof;
		(ii) a polypeptide chain comprising an amino acid sequence
	10 11	defined by residues 24-152 of Seq. ID No. 5 (ALK-3),, or as
u .a	12	OP1-binding analog thereof;
		(iii) a polypeptide chain comprising an amino acid sequence
mi i	13	defined by residues 23-122 of Seq. ID No. 7 (ALK-6),, or as
	14	OP1 binding analog thereof;
- <u></u> -	15	
<u></u>	16	(iv) a polypeptide chain having binding affinity for OP-1 and
<u> </u>	17	sharing at least 40s amino acid identity with residues 23-
	18	122 of Seq. ID No. (ALK-6),;
<u> </u>	19	(v) a polypeptide chain having binding affinity for OP-1 and
of of his	20	encoded by a nucleic acid obtainable by amplification with
w Li	21	one or more primer sequences defined by Seq. ID Nos. 12-15
7	22	or
	23	(vi) a polypeptide chain having binding affinity for OP-1 and
	24	encoded by a nucleic acid that hybridizes under stringent
	25	conditions with a nucleic acid comprising the sequence
	26	defined by nucleotides 256-552 of Seq. ID No. 7 (ALK-6),;
	27	(b) contacting said sample with a candidate OP1 receptor- binding
	28	analog; and
	29	(c) detecting specific binding between said candidate OP1 receptor-
	30	binding analog and said protein.
	1	2. A method for identifying an OP-1 receptor-binding analog, said
	2	analog being characterized as having substantially the same
	3	binding affinity for a cell surface receptor as OP1, the method
•	4	comprising the steps of:

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5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	(a) providing a cell that expresses a surface receptor protein having binding specificity for OP-1 selected from the group consisting of: (i) a polypeptide chain comprising an amino acid sequence defined by residues 16-123 of Seq. ID No. 3 (ALK-2), or an OP1-binding analog thereof; (ii) a polypeptide chain comprising an amino acid sequence defined by residues 24-152 of Seq. ID No. 5 (ALK-3),, or an OP1-binding analog thereof; (iii) a polypeptide chain comprising an amino acid sequence defined by residues 23-122 of Seq. ID No. 7 (ALK-6),, or an OP1 binding analog thereof; (iv) a polypeptide chain having binding affinity for OP-1 and sharing at least 40% amino acid identity with residues 23-122 of Seq. ID No. 7 (ALK-6); (v) a polypeptide chain having binding affinity for OP-1 and encoded by a nucleic acid obtainable by amplification with one or more primer sequences defined by Seq. ID Nos. 12-15; or (vi) a polypeptide chain having binding affinity for OP-1 and encoded by a nucleic acid that hybridizes under stringent conditions with a nucleic acid comprising the sequence defined by nucleotides 256-552 of Seq. ID No. 7 (ALK-6),; (b) contacting said cell with a candidate OP1 receptor-binding analog; and detecting induction of an OP-1-mediated cellular response.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	The method of claim 2 wherein said OP-1 mediated cellular response detected in step (c) is induction of a kinase activity, inhibition of epithelial cell growth, or induction of a cell differentiation marker. The method of claim 2 or 3 wherein said cell comprises a transfected nucleic acid comprising a reporter gene in operative association with a control element derived from an OP-1 inducible protein.
_ 1 5. 2 3	The method of any of claims 1-4 wherein said sample further comprises part or all of a Type II serine/threonine kinase receptor protein having binding affinity for OP-1, activin or BMP-4.

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		• · · · · · · · · · · · · · · · · · · ·
0.0		or candidate analog comprising part of said sample provided to
		said receptacle.
23		The kit of claim 8 wherein said means in part (b) comprises either
1	9.	The kit of claim 8 wherein said means are interaction of OP-1
2		(i) means for detecting specific binding interaction of OP-1
3		of said candidate analog with said protein; or
A		(ii) means for detecting induction of an OP-1 mediated cellular
		response.
		The kit of claim 8 or 9 further comprising a serine/threonine Type II
(2)1/	10.	receptor having binding specificity for OP-1, activin or BMP-4.
2		An OP-1 receptor-binding analog produced by the method of any of claims
1	11.	An OP-1 receptor-binding analog produced 27
2		1-7 or use of the kit of claims 8-10.
1	12.	The analog produced by the method of any of claims 1-8, said analog
2		(i) comprising an amino acid sequence sharing greater than 60%
		identity with the C-terminal 96 amino acids of the sequence
4		represented by Seq. ID No. 9 (OP-1, residues 335-431), and
_		(ii) being substantially incapable of inducing an OP-1 mediated
		cellular response.
Ü		The analog of claim 11 or 12 further having binding affinity for a
1	13.	Type II serine/threonine kinase cell surface receptor.
2		Type II serime/timeomine Armos and Transporter also has binding
1	14.	The analog of claim 13 wherein said Type II receptor also has binding
2		affinity for activin of BMP-4.
1	15.	An isolated ligand-receptor complex comprising two molecules
2		interporting as specific binding partners, the first said molecule
3		defining said ligand and comprising at least the C-terminal 96 amino
4		acids of OP1 (residues 335-431 of Seq ID No. 9) or a receptor-binding
5		analog thereof, and the second said molecule defining said receptor and
6		being selected from the group consisting of
7		(i) a polypeptide chain comprising an amino acid sequence
8		defined by residues 16-123 of Seq. ID No. 3 (ALK-2), or an
9		OP1-binding analog thereof;
10		(ii) a polypeptide chain comprising an amino acid sequence
11		defined by residues 24-152 of Seq. ID No. 5 (ALR-3),, or the
12		OP1-binding analog thereof;
13		(iii) a polypeptide chain comprising an amino acid sequence
14		defined by residues 23-122 of Seq. ID No. 7 (ALK-6),, or an
15		OP1 binding analog thereof;
	2 3 4 5 7 1 2 1 2 3 4 5 6 7 8 9 10 11 12 13 14	1 9. 2 3 4 5 7 10. 2 1 11. 2 1 12. 2 3 4 5 6 1 13. 2 1 14. 2 1 15. 2 3 4 5 6 7 8 9 10 11 12 13 14

		(iv) a polypeptide chain having binding affinity for OP-1 and
16		(iv) a polypeptide chain having binding dreams? sharing at least 40% amino acid identity with residues 23-
17		sharing at least 40% amino acid identity
18		122 of Seq. ID No. 7 (ALK-6),;
19		(v) a polypeptide chain having binding affinity for OP-1 and
20		a bus a muchaic acid obtainable by amplification with
21		one or more primer sequences defined by Seq. ID Nos. 12-15;
22		or
22		(vi) a polypeptide chain having binding affinity for OP-1 and
23		anneled by a public acid that hybridizes under stringent
24		b nucleic acid comprising the sequence
25		defined by nucleotides 256-552 of Seq. ID No. 7 (ALK-6),.
26		The complex of claim 15 further comprising part or all of a Type II
1	.16.	The complex of claim 15 further compliance pro-
2	•	serine/threonine kinase receptor .
1	17.	The complex of claim 16 wherein said Type II receptor also has binding
2		affinity for activin or BMP-4.
1	18.	The complex of any of claims 15-17 wherein said first molecule defining
2	20.	is an OP-1 receptor-binding analog comprises pure
3		sologied from the group consisting of SUA, BAF-5, Dir
4		6, Vgr-1, OP2, OP3 and receptor-binding amino acid sequence variants or
5		xenogenic homologs thereof.
	10	An isolated binding partner having specific binding affinity for an
1	19.	in a ligand-recentor domplex, said complex being characterist
2 3		on Op-1 protein br an analog thereof in specific
4		interpretion with the ligand Midding domain of a cell surface leading
5		3 (MK-2), 5, or 7, or an Opt-Dinding disease
6		the said hinding partner having substantially no binding
7		for the uncomplexed form of said OP-1 protein or OP-1 protein analog.
	20	The invitated hinding partner of claim 19 wherein said binding partner
1 2	20.	is such as characterized as having substantially no binding arrange
3		for the uncomplexed form of said cell surface receptor protein or said
4	i	analog thereof.
_		The binding partner of claim 19 wherein said binding partner is a
1	21.	monoclonal or polyclonal antibody.
2		monoclonal of perfect and claims 11-14 in a method
1	22.	Use of the OP-1 receptor-binding analog of any claims 11-14 in a method
2	for	and the second s
3		(i) antagonizing OP-1 binding to a cell surface receptor; or
4	-	(ii) antagonizing induction of an OP-1 mediated cellular
5		response.

		The use according to claim 22 wherein said OP-1 receptor-binding analog
1	23.	The use according to claim 22 wherein sure
2		comprises an antibody having binding specificity for
3		(i) the ligand binding domain of a cell surface receptor defined
4		by Seq. ID Nos. 3, 5, or 7 or an OP-1 binding analog
5		thereof; or
2		(ii) the receptor binding domain of OP-1, represented by Seq. ID
6		No. 9, or a receptor-binding analog thereof.
7		
1	24.	Use of a protein selected from the group consisting of:
		chain comprising an amino acid sequence
2		defined by residues 16-123 of Seq. ID No. 3 (ALK-2), or an
3		OP1-binding analog thereof;
4		
5		(ii) a polypeptide chain comprising an amino acid sequence
6		defined by residues 24-152 of Seq. ID No. 5 (ALK-3),, or an
7		OP1-binding analog thereof;
8		(iii) a polypeptide chain comprising an amino acid sequence
		defined by residues 23-122 of Seq. ID No. 7 (ALK-6),, or an
9		OP1 binding analog thereof;
10		(iv) a polypeptide chain having binding affinity for OP-1 and
11		(iv) a polypeptide chain having binding discount its sharing at least 40% amino acid identity with residues 23-
12		sharing at least 40% amino acid rushous
13		122 of Seq. 10 No. 7 (ALK-6),;
14		(v) a polypeptide chain having binding affinity for OP-1 and
15		anded by a pucleic acid obtainable by amplification with
16		one or more primer sequences defined by Seq. ID Nos. 12-15;
17		or
		(vi) a polypeptide chain having binding affinity for OP-1 and
18		encoded by a nucleic acid that hybridizes under stringent
19		conditions with a nucleic acid comprising the sequence
20		defined by nucleotides 256-552 of Seq. ID No. 7 (ALK-6),;
21		↓
22		in a method for antagonizing
23	·	(i) OP-1 binding to a cell surface receptor; or
24		(ii) induction of an OP-1 mediated cellular response.
24		A method for antagonizing activin binding to a cell surface receptor,
1	25.	A method for antagonizing activin binding to 2 dead
. 2		the method comprising the step of:
3		providing a cell expressing a said receptor with a protein having
4		binding specificity for the amino acid sequence defined by
5		regidues 16-123 of Seg ID No. 3 or an OP-1 binding sequence
6		variant thereof, said protein sharing at least .60% amino acid

			3 25-431 of the sequence defined by
	7		sequence identity with residue 335-431 of the sequence defined by
	8		Seq ID No. 9,
	9		such that said protein, when provided to said cell, is competent
	10		to interact specifically with said receptor, thereby
			substantially inhibiting activin binding to said receptor.
	11	26.	A method for antagonizing BMP-4 binding to a cell surface receptor, the method comprising the step of:
	2		method comprising the stop or.
	3		providing a cell expressing a said receptor with a protein having binding specificity for the ligand binding domain defined by
	4		residues 24-152 of Seq ID No. 5 (ALK-3), or residues 23-122 of
	5		residues 24-152 of Seq 1D No. 5 (ADA 377 to 1977)
	6		Seq ID No 7 (ALK-6), or an OP-1 binding sequence variant
	7		thereof, said protein sharing at least 60% amino acid sequence
7	8		identity with residues 335-431 of the sequence defined by Seq ID
ā	9		No. 9,
	10		such that said protein, when provided to said cell, is competent
Ų	11		to interact specifically with said receptor, thereby
Ħ.	12		substantially inhibiting BMP-4 binding to said receptor.
E	1	27.	Use of the OP-1 receptor binding analog of claim 12-14 in the method of
The state of the s	2		claim 25 or 26.
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